



**Ginna**  
New York



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**RPPA 2.0 - 1**  
REP Post-Plume Awareness Course (RPPA)  
REP Program Essentials

# Module Objectives

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Given a current REP Program Manual (RPM), the student will be able to:

- ▶ *Describe* the essential purpose of the REP Program's offsite planning and preparedness assessment strategy and coordination of the National effort to provide State, local, and Tribal governments with relevant and executable planning, training, and exercise guidance and policies necessary to ensure that adequate capabilities exist to prevent, protect against, mitigate the effects of, respond to, and recover from incidents involving NRC-licensed commercial nuclear power plants (NPPs).



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# RPM Part I: The REP Program – Mission Statement

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“The primary mission of the Department of Homeland Security (DHS)/FEMA is helping people before, during, and after disasters. In support of the primary mission of DHS/FEMA, the THD REP Program:

- Ensure . . . governments can adequately protect . . .
- Inform and educate . . .
- Support and provide guidance . . .

The REP Program’s historical success lies in its ability to integrate and enhance Federal, state, local, and tribal governments’ preparedness planning and response and recovery capabilities for all types of radiological emergencies.”



Refer to RPM Part I § A.  
“Mission Statement” / pg. 5



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# REP Program Manual (RPM) - Purpose

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“The RPM serves as the principal source of guidance for the FEMA REP Program.

The evaluation criteria outlined in NUREG-0654/FEMA-REP-1, Rev. 2 are considered by FEMA to be an acceptable means for meeting the intent of the planning standards in 44 CFR 350.5 and for addressing offsite emergency plans and procedures. Further, FEMA, NRC, and other Federal agencies use the guidance contained in NUREG-0654/FEMA-REP-1, Rev. 2 in their individual and joint reviews of the radiological emergency response plans and preparedness of state, local, and tribal governments, and the plans and preparedness of applicants for, and holders of, a license to operate a nuclear power reactor.”



Refer to RPM Part I § B.  
“Purpose”/ pg. 5



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“In the communities surrounding commercial NPPs, 44 CFR 350.5(b) directs FEMA’s REP Program to review state, local, and tribal radiological emergency plans and preparedness. Approved plans and procedures “must be determined to adequately protect the public health and safety by providing reasonable assurance that appropriate protective measures can be taken offsite in the event of a radiological emergency.”



Refer to RPM Part I § B.  
“Reasonable Assurance” /  
pg. 6



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"FEMA defines reasonable assurance as a determination that NRC licensee or applicant onsite plans and state, local, and tribal government and utility offsite plans and preparedness are adequate to protect public health and safety in the emergency planning areas of a commercial NPP. FEMA will consider plans, procedures, personnel, training, facilities, equipment, drills, and exercises, which are all important to the effective implementation of protective measures offsite in the event of any incident at a commercial NPP."



Refer to RPM Part I § B.  
"Reasonable Assurance" /  
pg. 6



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"FEMA validates reasonable assurance using a holistic assessment strategy that allows for a comprehensive evaluation of offsite radiological emergency planning and preparedness using specific objectives and capability targets that meet the intent of the planning standards of 44 CFR 350 and support the assessment of core capabilities. FEMA assesses preparedness on an ongoing basis and reports out on the overall state of preparedness biennially, in the Biennial Preparedness Report, supported by input from OROs. This more focused approach to assessment can be found in **Part III.**"



Refer to RPM Part I § D.b  
"REP Program Assessment  
Strategy" / pg. 10

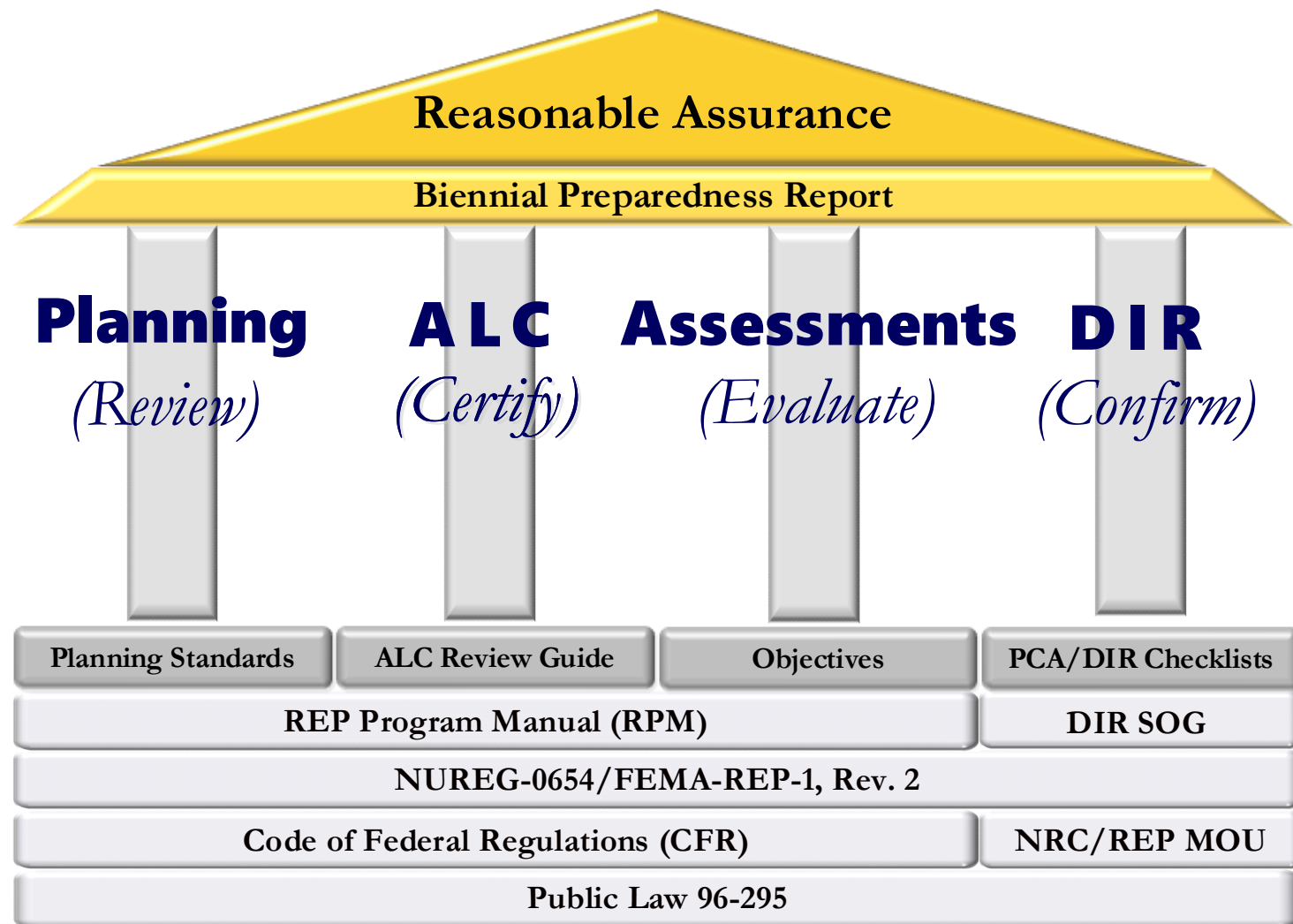


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# Planning and Preparedness Assessment Strategy



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*Refer to RPM Part 1 § B. "Planning and Preparedness Assessment Strategy" / pg. 6*

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# Planning and Preparedness Assessment Strategy

NRC

2019 RPM - FEMA REP Program and Preparedness Assessment Strategy, list of standards for each pillar

10 CFR 50.47(b)	44 CFR 350.5 Planning Standards	Annual Letter of Certification	Assessment Objectives	Disaster Initiated Review Checklists
	* Risk Significant			PCA Preliminary Capabilities Assessment
1	A Assignment of Responsibility	I Update of Plans/Procedures and Letters of Agreement	1 Emergency Operations Management	I Emergency Response Facility
2	B Onsite Emergency Organization	II Public Education and Information	2 Exposure Control	II Communications
3	C Emergency Response Support and Resources	III Radiological Emergency Response Training	3 Alert and Notification	III Emergency Response Organizations
4	D Emergency Classification System *	IV Drills	4 Detect, Measure, Sample, Analyze, and Assess	IV Public Alert and Notifications
5	E Notification Methods and Procedures *	V 24-Hour Staffing	5 Operate	V Access/Functional Need and Transportation Resources
6	F Emergency Communications	VI Emergency Facilities and Equipment		VI Evacuation Routes
7	G Public Education and Information	VII Responsibility for the Planning Effort		VII Accident Assessment Resources
8	H Emergency Facilities and Equipment	VIII Alert and Notification		VIII Support Services
9	I Accident Assessment *			IX Population Shifts
10	J Protective Response *			
11	K Radiological Exposure Control			
12	L Medical and Public Health Support			
13	M Recovery and Reentry Planning and Post-Accident Operations			
14	N Exercises and Drills			
15	O Radiological Emergency Response Training			
16	P Responsibility for the Planning Effort: Development, Periodic Review, and Distribution of Emergency Plans			



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# RPM Scope

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“The RPM provides FEMA guidance that interprets the planning standards and associated evaluation criteria in NUREG-0654/FEMA-REP-1, Rev. 2. This guidance provides additional detail to OROs on what is expected to be included in their radiological emergency plans. Further, the RPM provides information and guidance (e.g., checklists, templates, references, etc.) to help FEMA staff and OROs perform various REP Program functions.”



Refer to RPM Part I § C.  
“Scope” / pg. 7



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# Alignment with NUREG-0654/FEMA-REP-1, Rev.2

“This Manual reflects the updated policy and guidance changes found in the recently revised NUREG-0654/FEMA-REP-1, Rev. 2. The incorporated changes include the updating and modernization of general emergency planning information pertinent to commercial NPPs; further, there was a refocusing of the evaluation criteria on overall emergency preparedness program capabilities essential to meet each of the planning standards found in NRC regulations at 10 CFR 50.47(b) and FEMA regulations at 44 CFR 350.5(a). While reflected throughout the RPM, the majority of the changes associated with the update of NUREG-0654/FEMA-REP-1, Rev. 2 can be found in Part II.”



Refer to RPM Part I § D.2.a.  
“Alignment” / pg. 9

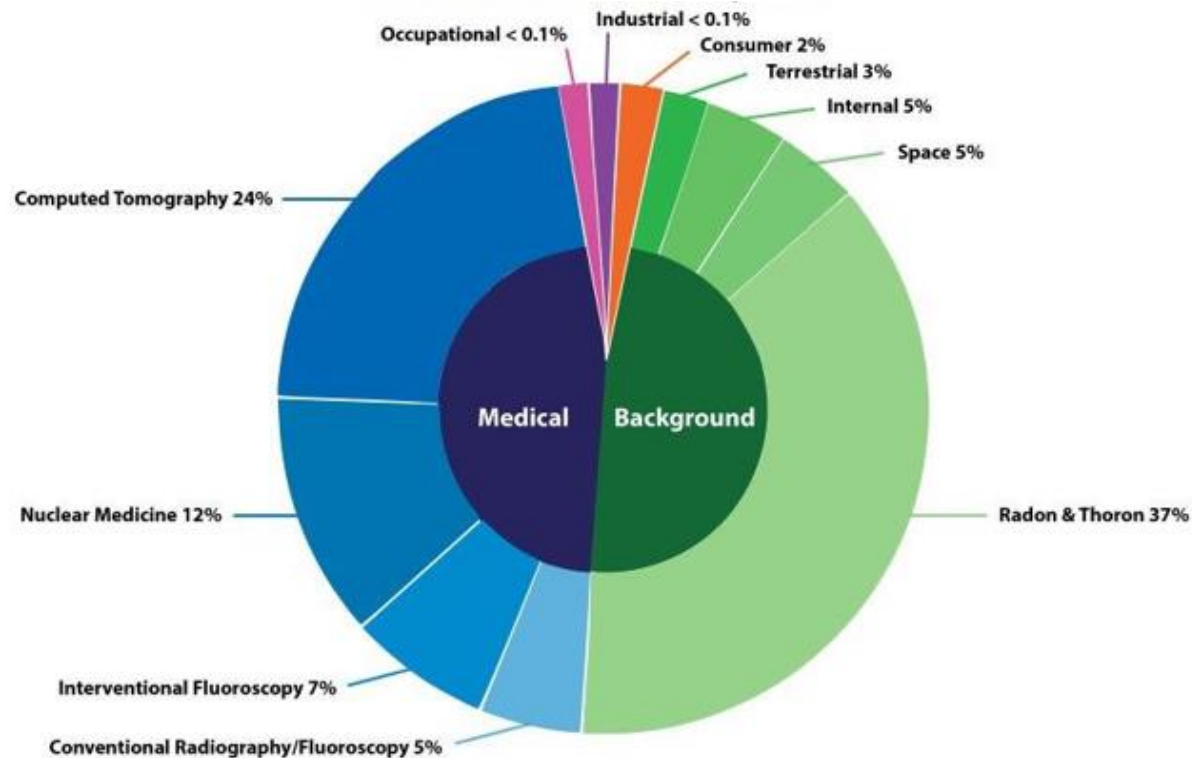


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# Sources of Radiation Exposure



Average Annual Radiation Dose											
Sources	Radon & Thoron	Computed Tomography	Nuclear Medicine	Interventional Fluoroscopy	Space	Conventional Radiography/Fluoroscopy	Internal	Terrestrial	Consumer	Occupational	Industrial
Units											
mrem (United States)	228 mrem	147 mrem	77 mrem	43 mrem	33 mrem	33 mrem	29 mrem	21 mrem	13 mrem	0.5 mrem	0.3 mrem
mSv (International)	2.28 mSv	1.47 mSv	0.77 mSv	0.43 mSv	0.33 mSv	0.33 mSv	0.29 mSv	0.21 mSv	0.13 mSv	0.005 mSv	0.003 mSv

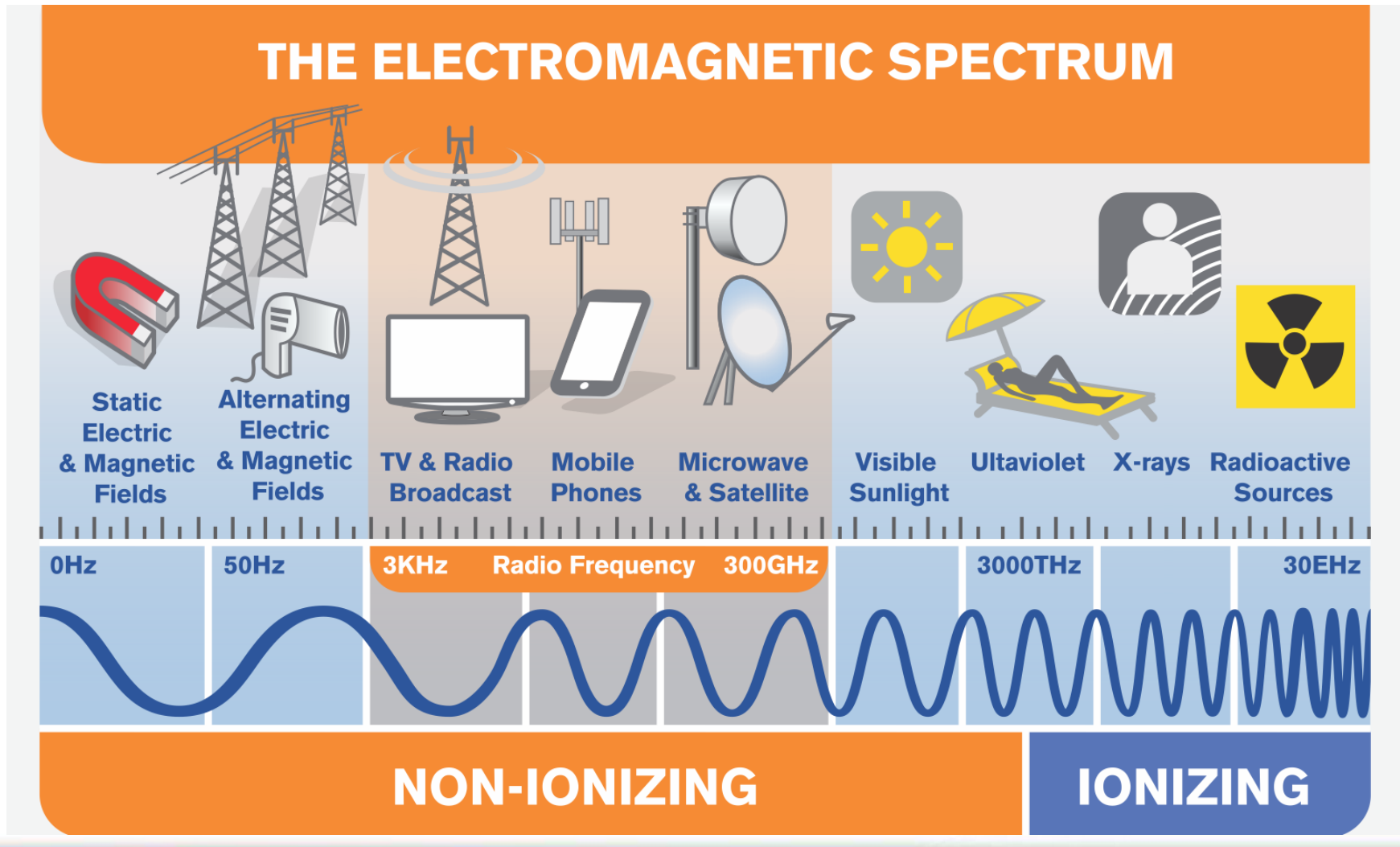
(Source: National Council on Radiation Protection & Measurements, Report No. 160)



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# Technical Basis of the REP Program



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Refer to RPM Part I § F.1 "Technical Basis of the REP Program" / pg. 14, 15

# Nature of the Hazard – Exposure vs. Contamination

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“It is important to distinguish between direct exposure to radiation and exposure through radiological contamination. A person exposed to a medical X-ray receives direct radiation, but the body is not radioactively contaminated. Radioactive contamination occurs when radioactive particles are deposited on a person’s skin and can be absorbed through the skin or by inhalation or ingestion.”



Refer to RPM Part I § F.1  
“Nature of the Hazard” /  
pg. 14

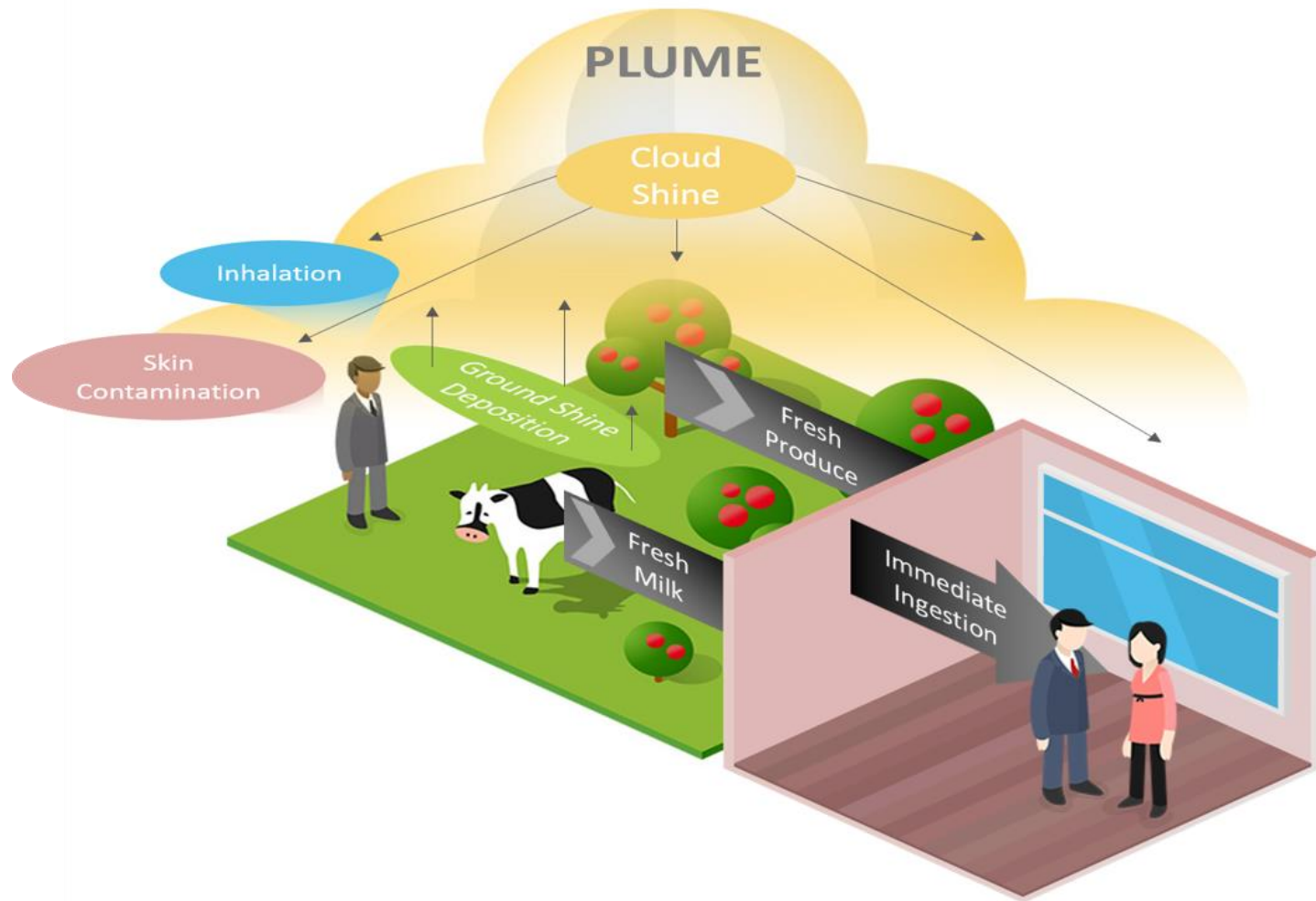


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# Nature of the Hazard – Potential Exposure Pathways



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Refer to RPM Part I § F.1 "Technical Basis of the REP Program" / pg. 14, 15

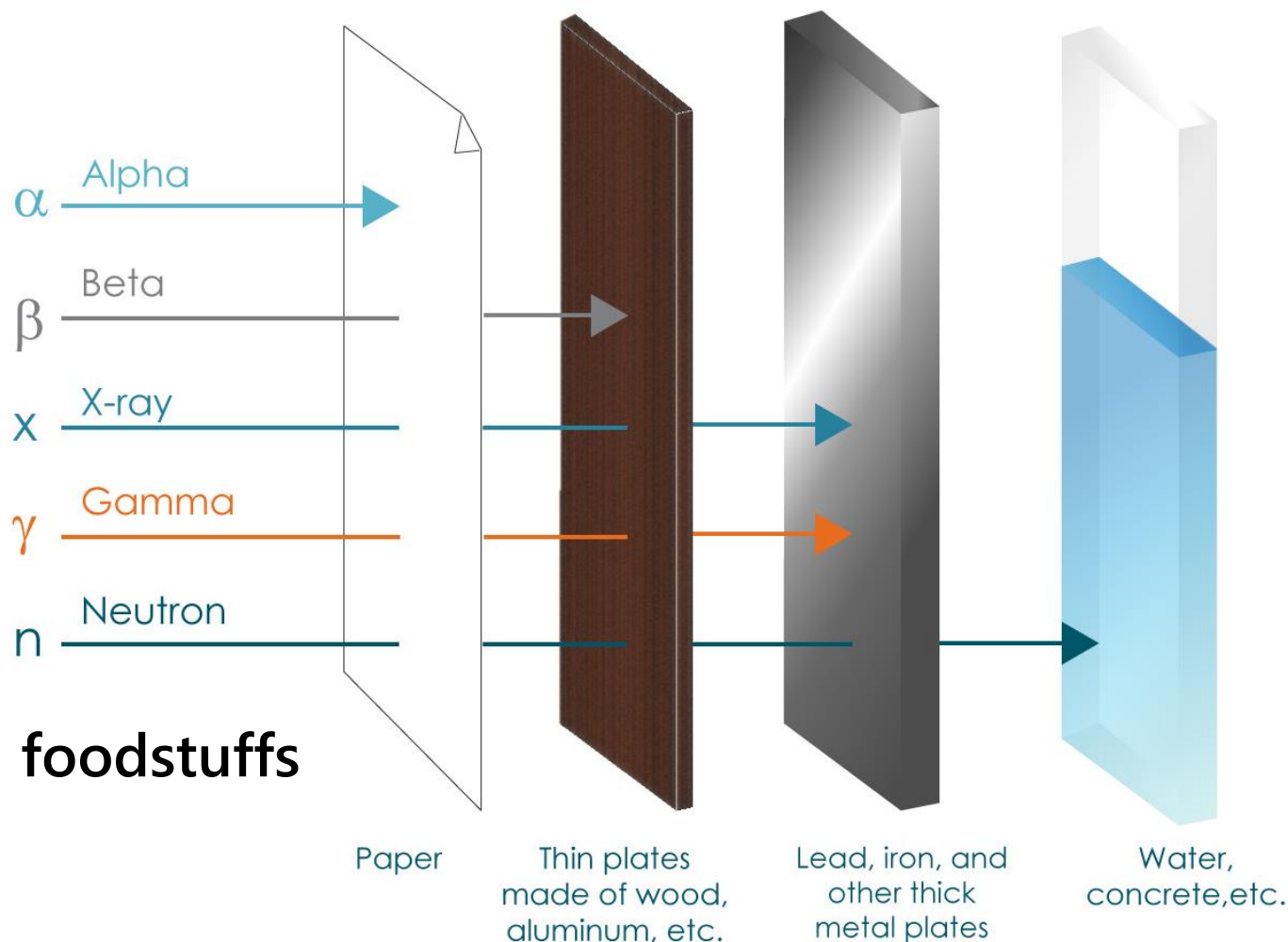
# Reduce Exposure to Radiation

Time,

Distance,

Shielding,

and limit the  
ingestion of  
contaminated foodstuffs



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Refer to RPM Part I § F.2 "Protective Actions to Reduce Exposure to Radiation" / pg. 15, 16



# Protective Action Guides (PAG)

“In an unexpected release of radioactive material, the licensee calculates a projected dose to estimate the potential level of exposure an individual would receive if no protective actions were taken. This projected dose is determined for a specific period of time using estimated or measured initial concentrations of radionuclides or exposure rates. A **PAG** is a number representing the projected dose to individuals that triggers the need for protective actions from a release of radioactive material. Decision-makers compare estimates of projected dose with the appropriate PAG to determine what actions to take.”



Refer to RPM Part I § F.3  
“Protective Action Guides”/  
pg. 16, 17



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# Protective Action Guides (General Public) – RPM Part 1 § F.3.a “General Public”/ pg. 16, 17

Table 1-1. Summary Table for PAGs, Guidelines, and Planning Guidance for Radiological Incidents<sup>a</sup>

Phase	Protective Action Recommendation	PAG, Guideline, or Planning Guidance
Early Phase	Sheltering-in-place or evacuation of the public <sup>b</sup>	PAG: 1 to 5 rem (10 to 50 mSv) projected dose over four days <sup>c</sup>
	Supplementary administration of prophylactic drugs – KI <sup>d</sup>	PAG: 5 rem (50 mSv) projected child thyroid dose <sup>e</sup> from exposure to radioactive iodine
	Limit emergency worker exposure (total dose incurred over entire response)	Guideline: 5 rem (50 mSv)/year (or greater under exceptional circumstances) <sup>f</sup>
Intermediate Phase	Relocation of the public	PAG: $\geq 2$ rem (20 mSv) projected dose <sup>g</sup> in the first year, 0.5 rem (5 mSv)/year projected dose in the second and subsequent years
	Apply simple dose reduction techniques	Guideline: $< 2$ rem (20 mSv) projected dose <sup>g</sup> in the first year
	Food interdiction <sup>g</sup>	PAG: 0.5 rem (5 mSv)/year projected whole body dose, or 5 rem (50 mSv)/year to any individual organ or tissue, whichever is limiting
	Drinking water	PAG: 100 mrem (1 mSv or 0.1 rem) projected dose, for one year, to the most sensitive populations (e.g., infants, children, pregnant women and nursing women); 500 mrem (5 mSv or 0.5 rem) projected dose, for one year, to the general population.
	Limit emergency worker exposure (total dose incurred over entire response)	Guideline: 5 rem (50 mSv)/year
	Reentry	Guideline: Operational Guidelines <sup>h</sup> (stay times and concentrations) for specific reentry activities (see Section 4.5)
Late Phase	Cleanup <sup>i</sup>	Planning Guidance: Brief description of planning process (see Section 5.1)
	Waste Disposal	Planning Guidance: Brief description of planning process (see Section 5.2)

## Early Phase

### PAGs for **General Public**:

- **Evacuation/Sheltering: 1-5 rem projected dose (4 days)**

## Intermediate Phase

**Relocation:  $\geq 2$  rem projected dose (1<sup>st</sup> year / 365 days)**

**.5 rem projected dose (2<sup>nd</sup> and subsequent years)**

**Ingestion: 0.5 rem projected whole body or 5 rem to most exposed part (1 year)**

Also refer to EPA PAG Manual [2017] Table 1-1 pg. 6



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# Protective Action Guides (Emergency Workers) – RPM Part 1 § F.3.b Emergency Workers/ pg. 17

Table 3-1. Emergency Worker Guidelines

Guideline	Activity	Condition
5 rem (50 mSv)	All occupational exposures	All reasonably achievable actions have been taken to minimize dose.
10 rem (100 mSv) <sup>a</sup>	Protecting critical infrastructure necessary for public welfare (e.g., a power plant)	Exceeding 5 rem (50 mSv) unavoidable and all appropriate actions taken to reduce dose. Monitoring available to project or measure dose.
25 rem (250 mSv) <sup>b</sup>	Lifesaving or protection of large populations	Exceeding 5 rem (50 mSv) unavoidable and all appropriate actions taken to reduce dose. Monitoring available to project or measure dose.
>25 rem (250 mSv)	Lifesaving or protection of large populations	All conditions above and only for people fully aware of the risks involved (see Tables 3-2 and 3-3)

## PAGs for **Emergency Workers**:

- A limit of **5 rem** for any emergency activity
- A limit of **10 rem** for protecting valuable property (when a lower dose is not practicable)
- A limit of **25 rem** for life-saving activities or protection of large populations when an emergency workers volunteers for the mission and is fully aware of the risks involved



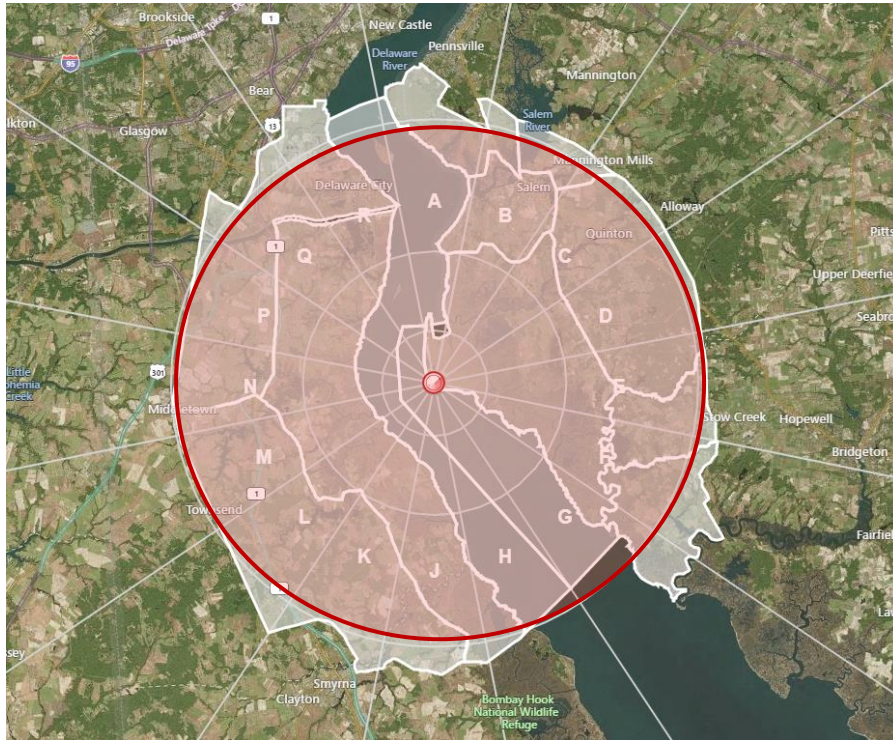
Refer to EPA PAG Manual [2017] Table 3-1 pg. 35



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# Emergency Planning Zone (10-mile EPZ) – Plume



Map Source: RadResponder

The size of the **plume exposure pathway EPZ, about 10 miles in radius**, is based on the following considerations from NUREG-0654/FEMA-REP-1:

- Projected doses from traditional design-basis accidents/incidents would not exceed the PAG levels outside the zone;
- Projected doses from most core damage sequences would not exceed PAG levels outside the zone;
- For the worst-case core damage sequences, immediate life-threatening doses would generally not occur outside the zone; and
- Detailed planning within approximately 10 miles would provide a substantial base for expansion of response efforts to a larger area, if necessary.



Refer to RPM Part I § F.4  
“Emergency Planning  
Zones”/ pg. 18



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Also, refer to RPM Part IV § B. “EPZ Boundary Changes” / pg. 228



# Emergency Planning Zone (50-mile EPZ) - Ingestion



Map Source: RadResponder

The size of the **ingestion exposure pathway EPZ**, **about 50 miles in radius**, including the 10-mile radius plume exposure pathway EPZ, is based on the following considerations:

- The downwind range within which contamination may potentially exceed the PAGs is limited to about 50 miles from an NPP because of wind shifts during the release and travel periods;
- Atmospheric iodine (i.e., iodine suspended in the atmosphere for long periods) may be converted to chemical forms that do not readily enter the ingestion exposure pathway; and
- Much of the particulate material in a radioactive plume would have been deposited on the ground within about 50 miles from the NPP.



Refer to RPM Part I § F.4  
"Emergency Planning  
Zones" / pg. 18



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Also, refer to RPM Part IV § B. "EPZ Boundary Changes" / pg. 228

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# Radiological Incident Phases

Potential Exposure Pathway	Phases		Protective Actions
		Site Area Emergency (SAE)	Precautionary protective actions
	Plume / Early (Emergency)	General Emergency (GE)	RESPONSE
External radiation from plume			<ul style="list-style-type: none"> <li>Sheltering</li> <li>Evacuation</li> <li>Control of access</li> </ul>
Inhalation of radioactivity in the plume			<ul style="list-style-type: none"> <li>Sheltering</li> <li>Stable Iodine</li> <li>Evacuation</li> <li>Control of access</li> </ul>
Contamination of skin and clothes		Post-Plume / Intermediate	<ul style="list-style-type: none"> <li>Sheltering</li> <li>Evacuation</li> <li>Decontamination of persons &amp; service animals</li> </ul>
External radiation from ground deposition			<ul style="list-style-type: none"> <li>Evacuation</li> <li>Relocation</li> <li>Decontamination of land and property</li> </ul>
Inhalation of resuspended radioactivity			<ul style="list-style-type: none"> <li>Relocation</li> <li>Decontamination of land and property</li> </ul>
Ingestion of contaminated food and water		Exposure Interventions	
		Ingestion	
		Late / Recovery	
		RECOVERY	
		Long-Term Recovery	

Incident at NPP

Start of Release

Release Under Control and environmental measurements available

No Additional Protective Actions Needed

**The early phase:** The beginning of a radiological incident for which immediate decisions for effective use of protective actions are required and must therefore be based primarily on the status of the radiological incident and the prognosis for worsening conditions. This phase may last from hours to days.

**The intermediate phase:** The period beginning after the source and releases have been brought under control (has not necessarily stopped but is no longer growing) and reliable environmental measurements are available for use as a basis for decisions on protective actions and extending until these additional protective actions are no longer needed. This phase may overlap the early phase and late phase and may last from weeks to months.

**The late phase:** The period beginning when recovery actions designed to reduce radiation levels in the environment to acceptable levels are commenced and ending when all recovery actions have been completed. This phase may extend from months to years. A PAG level, or dose to avoid, is not appropriate for long-term cleanup.



Refer to RPM Part I § F.5  
"Radiological Incident  
Phases"/ pg. 19



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Any questions  
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# RPM Part II: REP Program Planning Guidance

## – Purpose and Scope

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“This part of the REP Program Manual is the primary source of guidance pertaining to radiological emergency response planning. This guidance is intended for use by OROs for developing, reviewing, and revising radiological emergency response plans/procedures in support of the licensing and maintenance of a license for commercial NPPs.”



Refer to RPM Part II § A.1  
“Purpose and Scope”/ pg.  
21



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## **RPM Part II: REP Program Planning Guidance** — List of planning standards and associated NUREG-0654/FEMA-REP-1, Rev. 2 evaluation criteria

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- |   |  |
|---|--|
| <b>A</b> – Assignment of Responsibility             | <b>I</b> – Accident Assessment   |
| <b>B</b> – Emergency Response Organization          | <b>J</b> – Protective Response   |
| <b>C</b> – Emergency Response Support and Resources | <b>K</b> – Radiological Exposure Control   |
| <b>D</b> – Emergency Classification System          | <b>L</b> – Medical and Public Health Support   |
| <b>E</b> – Notification Methods and Procedures      | <b>M</b> – Recovery, Reentry, and Post-Accident Operations   |
| <b>F</b> – Emergency Communications                 | <b>N</b> – Exercises and Drills  |
| <b>G</b> – Public Education and Information         | <b>O</b> – Radiological Emergency Response Training  |
| <b>H</b> – Emergency Facilities and Equipment       | <b>P</b> – Responsibility for the Planning Effort: Development, Periodic Review, and Distribution of Emergency Plans |

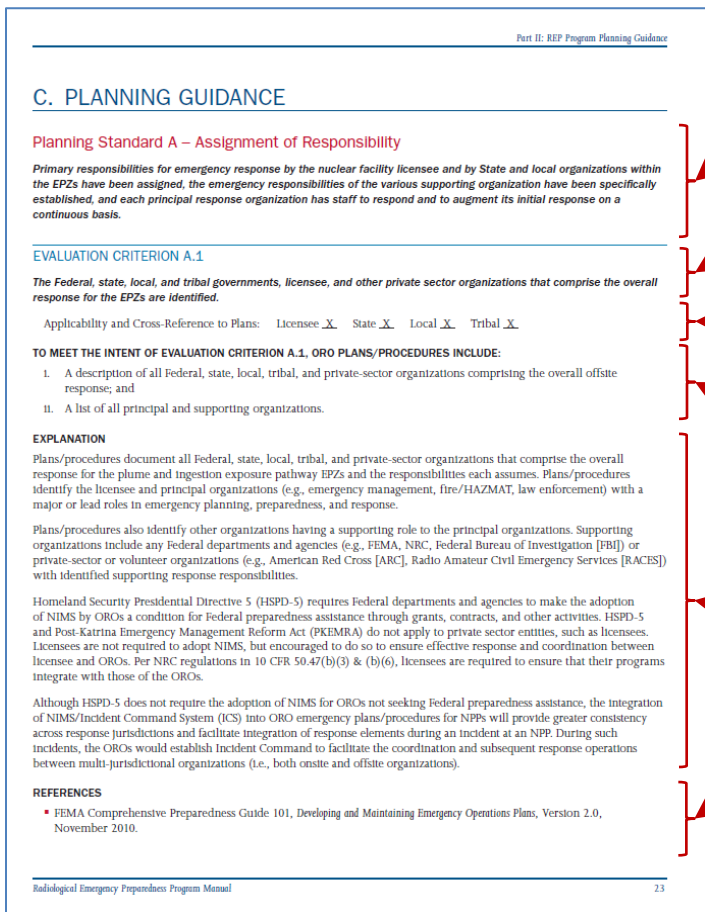


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Refer to RPM Part II § B. "Planning Standards" / pg. 22

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# RPM Part II: REP Program Planning Guidance - Format



**Planning Standard (PS) (e.g., “A”)**

**Associated NUREG-0654/FEMA-REP-1, Rev.2 Evaluation Criteria (EC) (e.g., “A.1”)**

**Applicability to Licensee, State, Local or Tribal plans**

**To Meet The Intent (MTI) of Evaluation Criterion, ORO Plans/Procedures Include: (e.g., “A.1.i”)**

PS	EC	MTI
A	.1	.i
	(A.1.i)	

**Explanation**

**References**




**Refer to RPM Part II § C.  
“Planning Guidance” / pg.  
23**



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Any questions  
about Part II of  
the REP Program  
Manual?



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# RPM Part III: REP Program Assessment Policies and Guidance

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"In this Part of the RPM, FEMA provides guidance for REP controllers, evaluators, and those responsible for planning, preparing, and executing REP assessment activities."



Refer to RPM Part III § A.  
"Introduction"/ pg. 163



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# RPM Part III: Contents and Organization

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**Subpart B** [RPM pgs. 164-182], **REP Assessment Policies and Process**, identifies the unique regulatory requirements of the REP Program that affect the scheduling, design and development, evaluation, and improvement planning associated with the assessment activities. This subpart also explains the process for requesting and receiving REP assessment activity credit.

**Subpart C** [RPM pgs. 183-224], **REP Objectives and Capability Targets**, describes the common metrics used to evaluate a REP Program assessment activity during the biennial assessment period in terms of objectives, capability targets, and core capabilities. The objectives/capability targets are derived from the planning standards of 44 CFR 350, support the evaluation criteria from NUREG-0654/FEMA-REP-1, Rev. 2, and are used as the baseline for assessing ORO preparedness in terms of core capabilities.



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# RPM Part III.C: REP Objectives/Capability Targets

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OBJECTIVE 1: Emergency Operations Management

OBJECTIVE 2: Exposure Control

OBJECTIVE 3: Alert and Notification

OBJECTIVE 4: Detect, Measure, Sample, Analyze, and Assess

OBJECTIVE 5: Operate



Refer to RPM Part III § C.1  
"REP Objectives/Capability  
Targets"/ pg. 183-184



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# RPM Part III: Assessment Objectives - Format

**Objective (OBJ) (e.g., "1")**

**Capability Target (CAT) (e.g., "1.1")**

**NUREG-0654/FEMA-REP-1, Rev.2  
Evaluation Criteria Reference**

**Critical Tasks (CRT) (e.g., "1.1.1")**

**Key Points of Review (KPR) (e.g., "1.1.1.1")**

OBJ	.CAT	.CRT	.KPR
1	.1	.1	.1
		(1.1.1.1)	



Part III: REP Program Assessment Policies and Guidance

**Objective 1: Emergency Operations Management**

**Capability Target 1.1: Mobilization**

*Individuals with roles in support of emergency operations are identified, alerted, and mobilized in a timely manner.*

**Intent:** The capability to alert, notify, and mobilize OROs to staff facilities in support of emergency operations.

**Planning reference:** NUREG-0654/FEMA-REP-1, Rev. 2 (A.1, A.1.a, A.1.b, A.3, A.4, A.5, C.1, C.2, C.2.a, C.2.b, C.3, E.1, E.1.a, E.3, F.1.c, H.6, and O.1)

**Core Capabilities:** Operational Coordination; Planning

**ASSESSMENT - DEMONSTRATION AND EVALUATION GUIDANCE**

By observing the OROs' capability to address the appropriate bullet points below and while considering the overall capability being assessed, the following key points of review and associated questions should be considered and will support an evaluation of this capability target.

ORO demonstrate the capability to:

1. Alert, notify, and mobilize key personnel, to include a 24-hour staffing roster, and activate facilities in a timely manner.
  1. What time was staff notified? What time did they arrive at the facility?
  2. Did the ORO demonstrate the activation of facilities for immediate use by mobilized personnel upon their arrival?
  3. Was activation of facilities/locations completed in accordance with plans/procedures?
  4. Were key emergency personnel contacted, alerted, and mobilized in a timely manner?
  5. Did the ORO demonstrate the ability to staff and maintain 24-hour operations?
  6. Were position staff trained and in place for facility activation?
2. Receive and verify notifications.
  1. Who notified the ORO? Licensee or other?
  2. For reverse notification, how was the licensee notified?
  3. Was the notification/information verified? How?
  4. What was the initial ECI? Were changes to ECIs communicated in the same manner?
3. Identify and request additional resources, as needed.
  1. Was the ability to identify and request additional resources demonstrated? If not, was the ability to identify compensatory measures demonstrated?
  2. Were MOUs and LOAs available for review?
4. Determine a facility is operational.
  1. What time was the facility declared operational?
  2. What criteria was used to determine if the facility was operational?
  3. What was the time difference between notifications of personnel and when the facility was declared operational?

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Refer to RPM Part III § C. "Objective 1: Emergency Operations Management" / pg. 185

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REP Post-Plume Awareness Course (RPPA)  
REP Program Essentials



Any questions  
about Part III of  
the REP Program  
Manual?



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# RPM Part IV: FEMA REP Program Administration

Part IV: FEMA REP Program Administration

## PART IV: FEMA REP Program Administration

### INTRODUCTION

The intent of this part of the RPM is to provide general guidance on the FEMA REP Program administrative policies and procedures. Examples provided in Part IV are meant to show how a particular task may be accomplished, but are not intended to mandate a specific way of accomplishing tasks.

Following this introduction, the contents of Part IV are:

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B. Emergency Planning Zone Boundary Changes	Pg. 228
C. Credentialing Framework	Pg. 229
D. REP Exercise Process Milestones and Frequencies	Pgs. 230-233
E. Use of State, Local, and Tribal Personnel as REP Exercise Evaluators	Pg. 236
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K. Conducting Scenario Reviews	Pg. 246
L. Annual Letter of Certification	Pgs. 247-248
M. Public Information Review Guide and Process	Pg. 249
N. Preliminary Capabilities Assessment and Disaster-Initiated Review	

“The intent of this part of the REP Program Manual is to provide general guidance on the FEMA REP Program administrative policies and procedures. Examples provided in this Part are meant to show how a particular task may be accomplished but are not intended to mandate a specific way of accomplishing tasks.”



Refer to RPM Part IV  
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# RPM Part V: REP Program Alert and Notification Systems (ANS) Guidance

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  - 2. FEMA's Roles and Responsibilities
  - 3. Evaluation Process Flow
  - 4. Licensee and ORO Roles and Responsibilities
- C. ANS Evaluation Report Guidance.....pgs. 255-258



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# Appendices:

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# Transition and Summary

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- **Module 2.0** familiarized the participant with the essential REP Program elements.
- **Module 3.0** will discuss Plume (Emergency/Early) Phase Responsibilities/Actions by Emergency Classification Level.



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